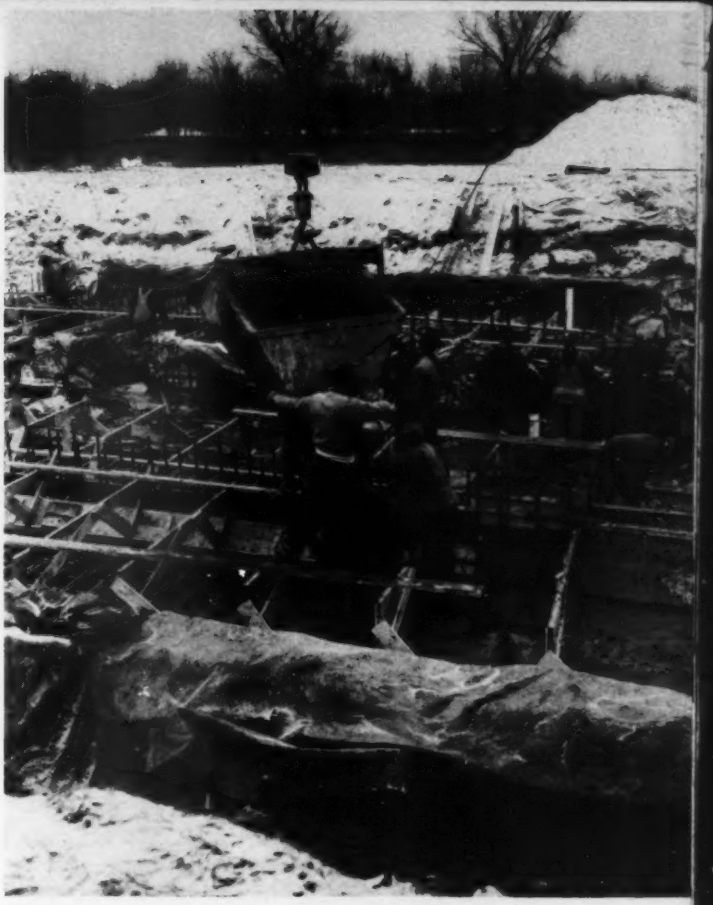
CONCRETE AND WINTER...

Still probably not an ideal combination, but there are no longer any overpowering reasons for not putting them together



Below freezing temperatures have not interfered with this job. Thorough preparation before placing began, a properly designed mix and attention to cold weather curing will assure good concrete in spite of the weather.

NO LONGER DOES THE BUILDING CONTRACTOR look upon winter as a do-nothing season. Instead he meets every blow from the weather with a punch of his own—and comes out on top. He recognizes that his business is a year-round operation, with seasonal changes in working methods. A four-month shutdown is neither necessary nor desirable.

Yet there is no denying that winter brings special problems. Snow, sleet, freezing temperatures, and frozen earth add up to a king-sized headache, especially for the concrete contractor. The best time for concrete work is on a day when the temperature is about 70 degrees F. The worst time is when the mercury dips far below freezing.

One of the basic problems of winter concreting is that newly placed concrete soon deteriorates if it freezes before it cures. The only thing to do with concrete that has frozen is to tear it out and replace it. This not only costs money but also short changes the builder in such intangibles as pride and goodwill.

In the old days cost considerations alone prompted many a contractor to lay down his tools with the first frost of the season. One conservative estimate puts winter-time concrete construction costs at 8 to 10 percent above warm weather costs.

As winter approaches the contractor must sink money into extra equipment and materials. The stress on tools and machines adds up to unexpected repair bills and labor is definitely less productive in chilly weather than on comfortable days.

But in spite of the cost factor, most efficient contractors find that winter concreting pays off in the long run. By working through the winter, contractors fill obligations that might otherwise be forfeited. Frequently they pick up jobs that would go to a competitor. Even a small winter contract may lead to bigger jobs in the regular construction season.

If it escapes freezing, concrete placed at low temperatures is often stronger and more durable than concrete placed in hot weather. Thus, from the standpoint of quality alone, the wintertime contractor has plenty of incentive to go ahead with the job.

Only the foolish rush blindly into a winter concreting job. Few projects can be looked upon as routine, particularly if the temperature drops much below freezing. If the job is to be successful,

the contractor must heed a few simple rules and must adhere to some well established practices.

At the outset, the contractor must be sure that he receives sufficient compensation from winter work to offset the inevitable additional costs. Making the estimate may be difficult. Bidding takes more time and involves touchier considerations in the winter than in the warm-weather months. A job that looks easy at the start may prove to be costly and troublesome.

Can you maintain a reasonable profit margin? Can you deliver the same high standards of workmanship that you put forth in the summer? Do you have the necessary equipment for wintertime work? Is your crew thoroughly briefed on the problems it must wrestle with?

Such questions as these must be answered before a builder agrees to a cold-weather job. The old hands have a way of shifting gears when the frost bites and the snow begins to fall. They have a ready solution based on experience for most of the seasonal problems that arise. But the inexperienced should move cautiously.

The astute contractor sizes up his building site with extra care in the winter. If the location is off the beaten path, he makes certain there is adequate drainage and that he can get his equipment through to the job site. He may find it necessary to build temporary roadways.

Frozen ground presents a vexing situation at the very beginning. Under no circumstances should concrete be placed on a frozen subgrade; the outcome is almost certain to be poor. Artificial thawing is prudent even if the subgrade is coated only by a thin layer of frost.

The subgrade can be thawed in several different ways. One popular method is to burn straw atop the frigid surface. The straw should be covered with sand. Under favorable conditions the heat given off by the smoldering straw can melt ice and frost down to a depth of 18 inches.

Surface heaters sometimes turn the trick, but it takes time to thaw solidly frozen ground with a heater. A layer of hot sand and screenings will take care of subgrades that are frozen only to small depths. Steam jets are particularly effective against ice and frost on forms.

Frequently the preparation for winter concreting adds up to a bigger job for the contractor than the placing of the concrete itself. In these days, the general availability of ready mixed concrete goes a long way toward reducing the agonies of wintertime placement. Ready mixed concrete can readily be prepared for cold-weather use.

Whatever the air temperature, the supplier strives to deliver a concrete mix at a temperature suitable for placing. Under moderate conditions, a mix can be satisfactorily placed if its temperature is at least 50 degrees F. In cold weather, the supplier may heat the water for the mix, or both the water and the aggregates, to bring the mix to the desired temperature.

In subfreezing weather, it is not unusual for the supplier to heat the mix to a temperature of 80 to 90 degrees F. At this level the mix retains much of its heat after the concrete is placed. The heat of hydration also helps out as the concrete begins to set.

A mix delivered for winter-time often contains calcium chloride or some other accelerator. The supplier adds up to 2 percent calcium chloride by weight of the cement. The calcium chloride increases the rate of hydration, making it possible for the concrete to set rapidly and to attain a high early strength. All this offsets the delaying effects of cold weather.

The supplier should also put an air entraining agent into the winter-time mix. Air entrainment is essential in the winter. Without it the contractor doubles his risk. Air entrainment helps to prevent freezing and contributes to a superior product. Even concrete placed at favorable temperatures turns out better if it is air entrained.

Heating, accelerators, and air entrainment take much of the bite out of winter for the concrete man. But, as the mercury goes down, these agents can do only part of the job. There comes a time when the contractor, too, must do his part. Concreting becomes a touch-and-go job when the winter is at its worst.

At air temperatures below 70 degrees F., the

EFFECT OF CALCIUM CHLORIDE TO INCREASE STRENGTHS AT VARIOUS TEMPERATURES

Type 1 Portland Cement

5½ sacks cement per cu. yd. 2½ to 3½ in. slump

Age at Test	Compressive strength psi Degrees F.			
	25	40	55	73
Without calcium chloride				
1 day	35	75	540	1310
7 days	575	1990	3480	4170
28 days	1470	4820	5810	5630
1 year	6350	7190	7540	6670
With 2% calcium chloride				
1 day	185	400	1290	2350
7 days	1795	3230	4280	4610
28 days	3800	4970	5850	5740
1 year	7350	7950	7460	7750

The use of calcium chloride in winter concrete affords protection by increasing the rate of hydration of the cement. The table above shows this effect in terms of compressive strength at various temperatures and ages at test.

setting and hardening of concrete starts to slow down. The slow-down is not particularly troublesome even at temperatures as low as 50 degrees F. But when the mercury sinks into the 40's, some cold-weather precautions should be taken. Full protection becomes necessary when the mercury approaches 32 degrees F., the freezing point of water. Curing stops altogether in freezing temperatures.

The heat of hydration provides a surprising degree of protection at fairly moderate temperatures. With this built-in safeguard, the forms alone will keep concrete warm enough to set properly at temperatures in the 40's. The forms must be left in place to confine the heat of hydration. With the proper mix, the forms will do the job in 48 hours.

For obvious reasons wood forms provide better protection than steel forms. Whatever the material, the form must be free of ice and frost. If you are suspicious of a form's protective qualities, test the corners and edges of the newly placed slab. These are the areas that are the most subject to freezing. If the forms are not providing adequate protection you can add some covers.

Even if the temperature drops to the 30's there is little to worry about. In near-freezing weather be certain that the concrete is air entrained and that it contains an accelerator such as calcium chloride. Your supplier of ready mixed concrete, as we have noted, can take care of these details.

The time for all-out protection comes when temperature readings are in the 20's. Heaters, enclosures, and protective coverings then become necessary to keep the concrete warm enough for proper curing and setting. Without them, there would be no way to take the chill off the air that sweeps across the newly placed concrete.

Salamanders are one of the best sources of heat. They are easy to install and are fairly economical.

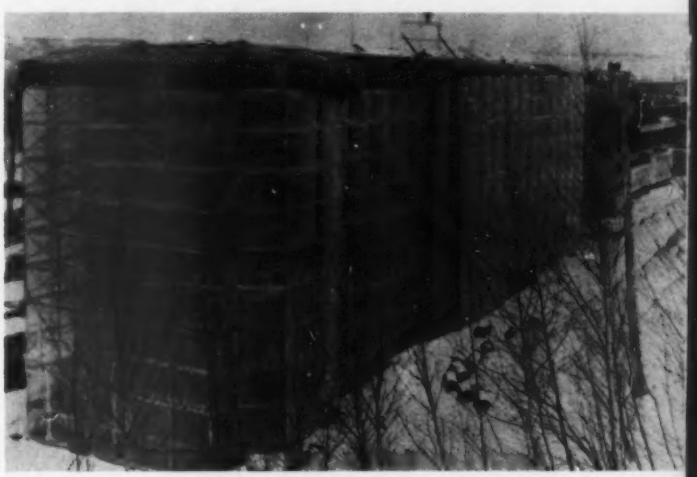
Never use a salamander carelessly. Make sure that it is vented. If a heater is unvented, there is danger of exposing the concrete to carbon dioxide, a by-product of the combustion. A concentration of carbon dioxide weakens concrete and lessens its durability.

Live steam is also an effective source of heat, and it has the important advantage of providing moisture along with warmth. When hot air heaters such as salamanders and radiators show a tendency to dry out the concrete, a small boiler with a steam jet will usually provide sufficient moisture under such circumstances.

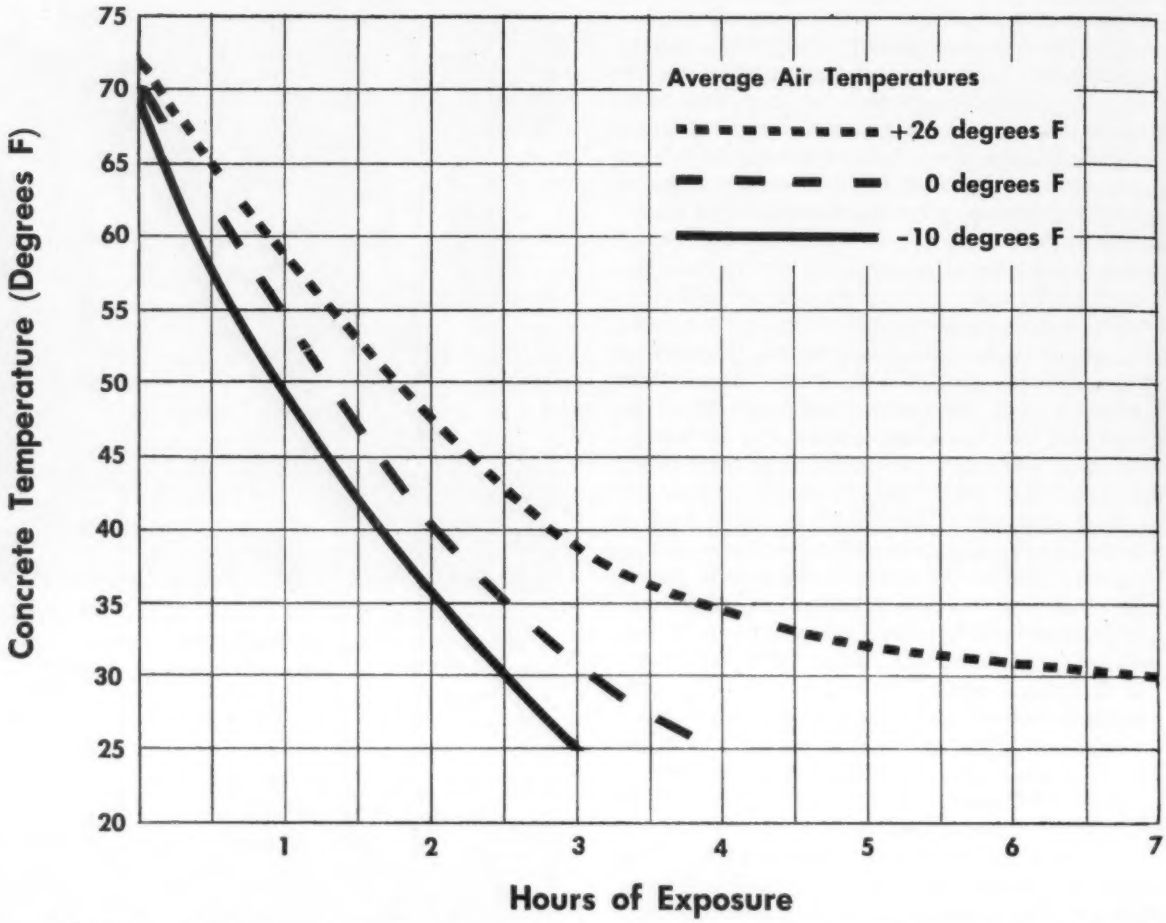
Heaters are commonly used within enclosures. Temperatures that are low enough to demand enclosures usually make heaters necessary at the same time. Precautions against fire must be taken if a heater is placed within an enclosure. Be sure the unit is kept away from inflammable materials.

The resourceful contractor often designs his own enclosure. He fits the structure to the materials that are at hand and to the conditions of the job site. A tarpaulin thrown over a framework serves adequately in many instances. An enclosure constructed of rigid materials, however, is far more effective. Such a structure is all but mandatory in near-zero weather.

Use as few openings as possible and make sure the structure is as windproof as possible. Wind tends to dry out concrete, and this can be as threatening as the temperature itself. Sometimes it is well to have sections in an enclosure that can be temporarily removed. With such an arrangement, the workmen can install additional



These photos show precautions taken against the effects of severe winter weather. Above, the formwork for a bridge bent is insulated with rock wool. Below, the building under construction is fully enclosed with polyethylene film and canvas as protection for both the concrete and the workmen.



This chart shows how the rate of temperature drop of concrete varies at different air temperatures. For example, concrete having a temperature of 70 degrees when placed will drop to about 25 degrees in 3 hours if the air temperature is 10 degrees below zero. Even at zero the temperature of the concrete drops to around freezing.

forms or even place more concrete if necessary.

A protective covering often serves adequately for a job that does not lend itself well to an enclosure. One of the newer protective coverings consists of blanket insulation enclosed in asphalt-coated liners. Such insulation has proven to be highly satisfactory. The liner should be tough and heavy to provide resistance against exposure and prolonged use, and to keep the insulation dry to maintain maximum effectiveness.

Plastic and polyethylene sheets often provide adequate protection at temperatures as low as 18 degrees F. These lightweight materials are fairly economical, and they are easy to handle. Polyethylene film can be thrown over a framework to provide an enclosure. Thin and lightweight, the polyethylene can easily be anchored into place.

Sisalkraft, building paper, and tar paper have many advantages as protective covers. They are economical, lightweight, and easy to use. Surprisingly enough, they provide adequate protection in really cold temperatures.

Form insulation is becoming popular with many contractors. The insulating material is easy to apply to firmly-backed forms. The material can be re-used, a factor that adds to its economy. Form insulation is especially suitable for floor slabs in instances where a floor below the slab is heated but the story above is not.

One of the most economical coverings is straw. By itself, straw is a poor thermal insulator, but it is often effective when used in conjunction with other materials. A tarpaulin serves adequately as a cover for straw when it is used on flat work.

Straw and a tarpaulin may take care of most winter jobs for many concrete men. Others may have to go all out in their approach to wintertime work. They may need heaters, enclosures, boilers, and coverings of all types. It all depends upon the job to be done.

But one thing is certain. No job is too big or too little for wintertime completion. Ask the construction worker in Maine, the highway engineer in Minnesota, and the builder of dams in Ontario. Each will tell you that concreting is a year-round job. They speak from experience. END

Irrigation channel in Australia is lined with concrete by slip-form unit developed by Australian engineers. An average of 500 linear feet of channel can be placed in a day. Best 8-hour day performance has been 780 feet.

CONTINUOUS SLIP-FORM FOR IRRIGATION CHANNELS

UNITED STATES CONTRACTORS engaged in doing similar work will be interested in a continuous slip-forming rig which Australian engineers have developed for lining irrigation channels. Named from the front of the unit backwards, the slip-form is made up of a skid pan, a partitioned hopper, a vibrating pad and a float pad and pressure blade.

Riding on the subgrade, the skid pan virtually steers the form. Its length is important as it affects the distribution of the weight of the form and the way the curves are negotiated. Partitioned into eight compartments, the hopper makes possible the even distribution of the concrete, a head of concrete above the feed being a necessary feature of the slip-form design.

The vibrating section consists of a quadrant of 4 inches radius along which the vibrators (either 6 or 8) are spaced. To avoid the dissipation of vibration to the structure as a whole, and particularly to the float pan and pressure plate, the vibrating pad is insulated from adjoining sections by rubber packing.

For the successful operation of the float pan and pressure plate it is essential for the form to travel exactly parallel to the bed. The pressure plate is adjustable by means of turnbuckles.

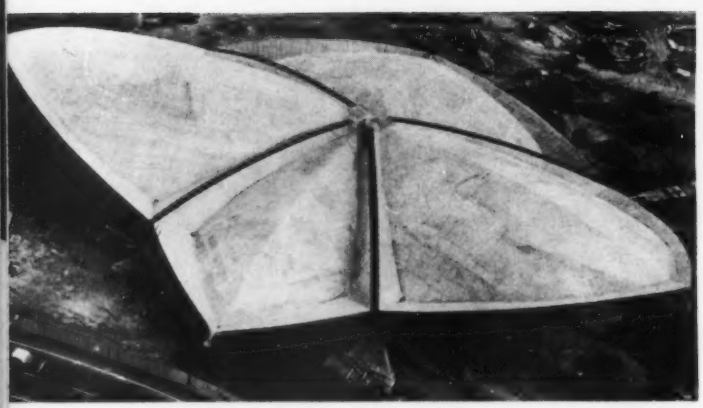
Initial earthworks involved the construction of the compacted banks and the completion of all lead by excavating with a dozer and scoop to a depth determined by the scoop width. This was followed by the excavation of the remaining section of channel and trimming of the channel section by a Briscoe ditcher towed by two tractors. Later the spoil was spread evenly over the banks on either side.

Hand trimming is essential in the sections of channel to be concrete lined. It is important that this work be kept sufficiently ahead of the slip-form to permit the latter's uninterrupted operation, but not so far ahead as to make the excavation subject to storm damage. Because the slip-form rides on the excavation, line and level must be closely controlled during excavation.

For best results with the continuous slip-form, concrete with a water/cement ratio of about 0.65 is used, with a sand content of approximately 45 percent and a slump of 1½ inches to 2 inches. A cement content of five bags per cubic yard is considered adequate.

The slip-form is advanced by means of a winch mounted on an anchoring device which automatically digs into the ground when the pull is applied. About 300 feet of travel is possible before the anchor must be shifted.

Moving at an average speed of 20 inches per minute, the Australians' best 8-hour day output with this slip-form has been 780 linear feet of channel having 1,360 square yards of surface. Average daily progress is just under 500 linear feet. END



The acre-sized thin shell sculptured roof of the TWA terminal at Idlewild International Airport created fantastic problems in forming and shoring. It demanded round-the-clock placing, with precise control of machines, materials and men.

Sculpture IN CONCRETE

Four concrete buttresses support the huge shell. There are no internal columns. In this picture a buttress section is shown after forms were stripped. Surface will later be bush-hammered to the texture selected by architect Eero Saarinen.

Photo courtesy Master Builders Co.

WHEN COMPLETED IN THE FALL OF 1961, architect Eero Saarinen's breathtaking TWA passenger terminal at Idlewild International Airport will stand as a monument to concrete and to the architectural, engineering and construction genius that created it. Architects, engineers and builders throughout the world will look upon the terminal as a remarkable achievement in design and construction long after it has become a familiar sight to travelers.

Above ground level, the structure is composed of only one piece of concrete. Yet the execution of this deceptively simple design required unparalleled ingenuity and planning long before the first cubic yard of concrete was ever mixed. The concrete—its design, delivery, installation, structural quality and final appearance—played a momentous role in achieving the function and beauty of Saarinen's architectural idea.

Of arch cantilever design, the 5,000-ton roof of the great building is of four monolithic concrete shells, flowing out of four sculptured buttresses. Joined integrally at a center plate, the shells vary in thickness from 8 inches at their perimeter to 44 inches at the centerplate. The building is one of the few major contemporary American structures in which all actual structural elements represent the final exterior architectural form.

While nearly every element of the structure represented a daring new adventure in construction, the sweeping 1¼-acre concrete roof presented the most staggering challenge to engineers and builders. The roof required the economical forming of

FILE: Thin Shell

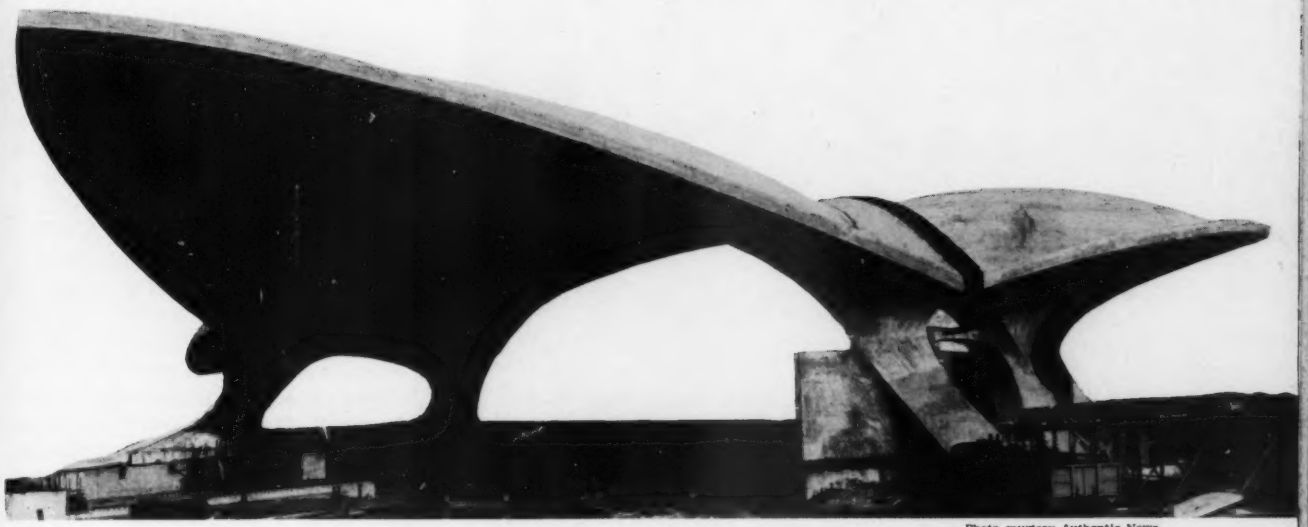


Photo courtesy Authentic News

The massive concrete roof shell is an arch cantilever design. Thickness ranges from 8 inches at the edges to 44 inches at the centerplate. Each shell is a continuous monolithic section and the complex roof geometry required counterforms to hold concrete on the steep slopes during initial set.

3,200 cubic yards of concrete into four perfectly balanced, monolithic roof sections, free of cracks, shrinkage stresses and construction joints, 60 feet above the ground.

Over two months of study, analysis, and computation preceded actual concrete work on the roof. The result was a complete manual that documented an unprecedented plan covering every detail of the operation from forming to finishing and fixing individual responsibility for ultimate completion of all tasks. Timing, an all important factor, was pin-pointed with relentless tolerances.

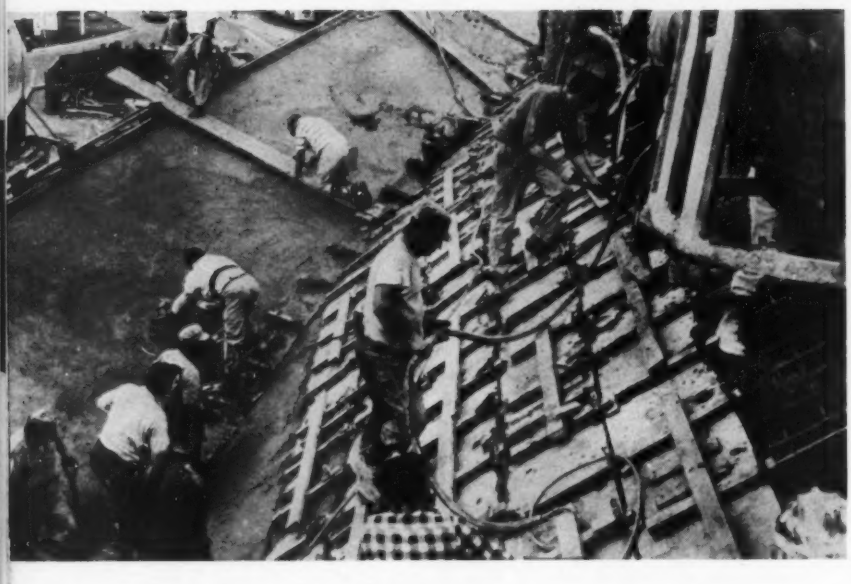
Three test models were constructed to simulate the placing conditions that would be experienced in different areas of the shell. These duplicated the angle of incline and the contours of the shell and the amount of intricate reinforcing steel in these areas. Work with these models showed that counterforms would have to be used where the slope of the shell was steep and that 5-inch slump was necessary to achieve easy placement of concrete beneath the counterform. In the less steep areas where counterforms were not necessary the concrete could be placed with 3-inch slump without flowing or sagging down the slope.

In designing the concrete mixes for the shell and buttresses, special consideration had to be given to four major factors: (1) The concrete must have the lowest possible unit water content and low cement content to minimize shrinkage. (2) Careful control of slump, which had to be varied for different areas of the shell, was essential. (3) The setting time had to be retarded sufficiently to assure a completely monolithic structure for each shell. (4) The setting time had to be varied according to a precise predetermined schedule, permitting an orderly removal of counterforms to allow finishing the surface of the shell to the final architectural contours.

Other mix design problems involved the selection of a coarse aggregate for the normal weight concrete of the buttresses and a lightweight aggregate for the shells—both aggregates of the same color to produce an overall uniform appearance for those areas that would ultimately be bush-hammered to achieve the striking surface texture desired by the architect. A low rate of heat evolution was required in the buttresses and in the thick sections of the shells to prevent thermal stresses and cracking. Four thousand psi strength at 28 days was specified for both the conventional and lightweight concrete. An admixture was specified as a water-reducing, plasticizing agent, as well as to control setting of the mixes to obtain different amounts of retardation in different areas of the shell.

The final scheme for placing the roof called for initial construction of a center plate that would act as a bulkhead against which to place the four shells and also provide a control station for subsequent concrete operations.

Once the formwork for the roof shells was built over a jungle of scaffolding, the concrete for the center plate and the four huge sculptured buttresses was placed. A total of 5,500 lengths of tubular steel went into the erection of 1,800 col-



Timing the removal of counterforms to allow finishing to the final architectural contours was critical. Precise set control of the concrete was essential. Close cooperation between the contractor, ready mixed concrete supplier and admixture manufacturer solved this problem.

umns required to support the vast roof form and the reinforcing steel and concrete that would go into it.

Three 180-foot, 45-ton cranes hoisted the concrete to the roof in one-cubic-yard loads, with each bucket color coded with paint to assure its contents were being deposited in the proper area of the shell.

When placing began, inspection crews of engineers and carpenters were stationed at key positions under the roof at ground level. Through a system of hanging plumbs, they were able to detect the slightest movement in the formwork and radio this information to the central control station so the next bucket load of concrete could be directed for placement at a point that would compensate for the form movement. Communications between the key operational points—two concrete placing sites, two admixture batching stations, and the inspection crews beneath the roof—were maintained through a system of ten field telephones and walkie-talkies.

As the admixture dispatching stations were advised of the amount of retardation desired for each truckload of concrete technicians representing the manufacturer of the admixture added the amount of their product necessary to achieve this result. The range of retardation was one to four hours beyond the normal setting time of the mix. Automatic dispensing equipment at the two dispatching stations facilitated the accurate addition of the material in amounts ranging from 0.25 to 0.40 pounds per sack of cement. In making these additions the technicians took into consideration the effect of changes in temperature over the 24- to 30-hour period during which the concrete was placed for each of the shells.

The counterforms were 2- by 4-foot sections of plywood, prefabricated and designed for easy removal. They were fastened to $\frac{7}{8}$-inch screed bars by lag bolts. When the concrete beneath the counterform had stiffened sufficiently to avoid flowing down the steep slope, the form was removed and the surface finished with a pair of shaped templates. A dozen or so pairs of these templates were clearly identified for use on specific areas of the shell—one type for screeding the concrete in the direction tangent to the circumference and the other for screeding perpendicular to the radii.

The field-side shell required 840 cubic yards of concrete placed in an around-the-clock operation of 27 hours. The front shell took 449 cubic yards of concrete placed in 24 hours. Each side shell required 1,006 cubic yards placed in 30 hours. The 28-day strength tests averaged 5,000 psi.

The next step in construction will be the erection of forms for placing the concrete floor. The interior, free of any visible supports, will have two floor levels. The building is to be enclosed with temporary wall material so interior work can continue into the winter. Two star-shaped loading buildings at the rear of the main terminal building will complete the project.

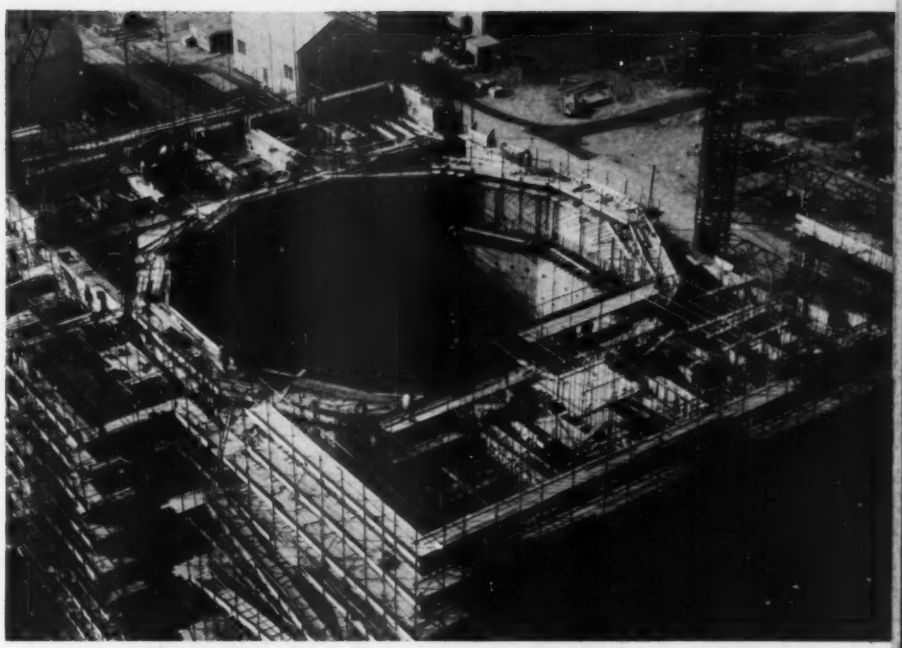
Kenneth P. Morris, field project manager for the contractors, Grove, Shepherd, Wilson and Kruge, Inc., calls this job "the biggest challenge to concrete and concrete men I've seen in my thirty years of construction. Every detail proceeded exactly as planned. The teamwork between our men, the resident architect, the engineers and the ready mix and admixture people was the finest I've ever seen . . . and the 5,000 tons of sculptured concrete you see standing there is the best proof I know."

END

Construction of Nuclear Power Stations

TO MOST OF US nuclear physics is a mystery. But the part concrete has played in the development of nuclear power stations is no mystery, nor are the construction techniques beyond the scope of any contractor. Concrete is the only practical material for a large permanent shield against the dangers of radiation. It also offers the advantages of being inexpensive, easy to build with, structurally self-supporting, virtually indestructible, and devoid of maintenance costs.

Authorities in both the United States and Europe are predicting that the economic breakthrough for nuclear power will occur around 1964 and 1965, and that the widespread use of nuclear energy for peaceful purposes will follow rapidly. Nuclear power plants are clean and compact and can be built almost anywhere. Coal and oil can be used more profitably as sources of synthetic raw materials than as sources of heat. It is none too soon to begin thinking about bidding on your first nuclear job.



Reactor structure for the British nuclear power station at Hinkley Point on the Bristol Channel just before the roof slab was placed. Note the many openings in the walls for operational and testing purposes.

radiation

How does a nuclear reactor work to produce electric power? Briefly stated, nuclear fission (the splitting of the atom) takes place at the center of the reactor. The splitting is done by bombarding the fuel (either uranium or plutonium) with neutrons. During the process vast quantities of energy are given off in the form of heat. This heat is absorbed by a primary cooling medium (frequently carbon dioxide gas), which passes to a heat exchanger. In the exchanger water is converted to steam and is used to drive a turbine and thus to generate electricity in the conventional way.

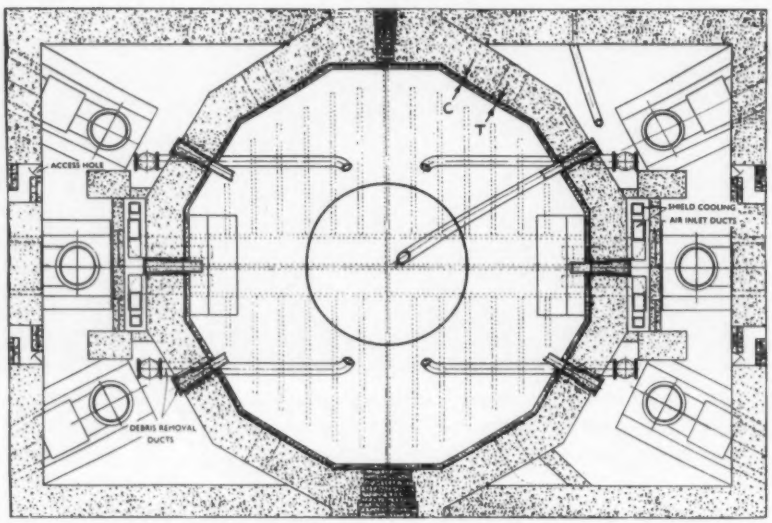
The most important task of concrete in this process is to provide a biological shield—an effective barrier against the lethal radiation. Just how the concrete behaves to absorb this radiation is difficult to explain, but some understanding of the action will make a nuclear concreting job more interesting. Essentially the two most severe forms of radiation emitted as products of nuclear fission are high energy gamma rays and fast neutrons. For practical purposes these two forms of radiation are the ones that the shield must absorb. Attenuation of the gamma rays is comparatively easy and is almost directly proportional to the density of the shield material. As density increases greater protection is therefore provided per unit of thickness.

The neutrons, on the other hand, are slowed down more ef-

FILE: Shielding

fectively in an entirely different way—by collision with lighter chemical elements. This simple elastic collision transforms the neutrons into low energy thermal neutrons, which are absorbed in proportion to the capture cross section of the various chemical elements in the concrete. The nuclei of hydrogen atoms are the most effective in slowing down the high energy neutrons and absorbing thermal neutrons, since their mass is almost the same as that of neutrons, and they have a high capture cross section. The hydrogen atoms in the concrete shield are provided by water which combines with the cement during placing.

Unfortunately maximum density is not compatible with maximum hydrogen (water) content. A balance must therefore be struck between these two factors if both gamma rays and neutrons are to be absorbed. In the design of the shield the degree of protection desired must also be related to the space available and to overall cost. Ordinary concrete provides the cheapest shield, but the thickness of the walls can be reduced by using special heavy aggregates to produce concrete of a greater density. The best known of these heavy aggregates are barytes, limonite, magnetite and graded steel scrap.



In this cross-sectional plan drawing of a reactor structure the letter "T" designates the thermal lining and the letter "C" indicates the space for the cooling medium.

View of the turbine hall at Hinkley Point showing some of the complex machinery foundations which are typical of such structures.

the British program

In British nuclear power stations ordinary reinforced concrete is used almost entirely for shielding purposes. Barytes concrete is used at some points where thin walls are needed for access purposes, but in general it is not popular. The high cost of special aggregates in Britain is probably the main reason for this. Barytes concrete has, however, found wide acceptance for many experimental reactors and in laboratories.

At present there are some twelve major nuclear power stations either in service or at some stage of construction in Britain, each of which contains, or will contain, from 70,000 to 350,000 cubic yards of concrete. The special position of Britain in this field should perhaps be explained. For centuries Britain has relied on coal as her only source of energy. The best quality seams of coal are now played out and the alternative is either imported oil or nuclear power. Strategically, nuclear power is preferable—hence the construction program.

The largest contractor for nuclear power work in Britain is Taylor Woodrow Construction Ltd., of Southall, Middlesex. This organization has just completed the civil engineering work for the Hinkley Point station on the Bristol Channel and is now break-

(continued on page 288)

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(continued from page 286)

ing ground for another 5-year job at Sizewell in Suffolk.

A study of the Hinkley Point project shows the extent to which concrete is used for a nuclear power station. The work is typical, even though Hinkley Point is the world's largest nuclear station, with an output of 500,000 kilowatts for the two reactors. The total quantity of concrete placed exceeded 300,000 cubic yards.

the reactor structure

A cross-sectional plan of one of the Hinkley Point concrete reactor structures is shown in the accompanying diagram. It comprises primarily a main biological shield 100 feet high, in the form of a 12-sided polygon, with secondary shielding walls surrounding it. The distance across the flats of the polygon is 76 feet and the thickness of the walls 7 feet. The secondary walls enclose an area 100 feet by 140 feet and are 6 feet thick. The whole structure is capped by a slab 11 feet 6 inches thick. The polygonal shape is chosen to minimize shrinkage effects and to give optimum structural benefit.

Each reactor is founded on a concrete raft, 120 feet by 150 feet, and around 11 feet deep, heavily reinforced in both directions. The raft contains some 8,000 cubic yards of concrete and approximately 380 tons of reinforcing steel, mostly of 1⅜-inch diameter. Construction was in four lifts, with each lift divided into bays, placing proceeding alternately in checkerboard pattern. To allow for shrinkage no concrete was placed against old concrete until three days had elapsed.

The concrete in all the shielding walls and roof slab has an average density, when completely dry, of not less than 140 pounds per cubic foot. Crushing strength

(continued on page 290)

Gates

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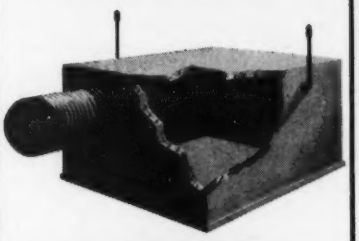

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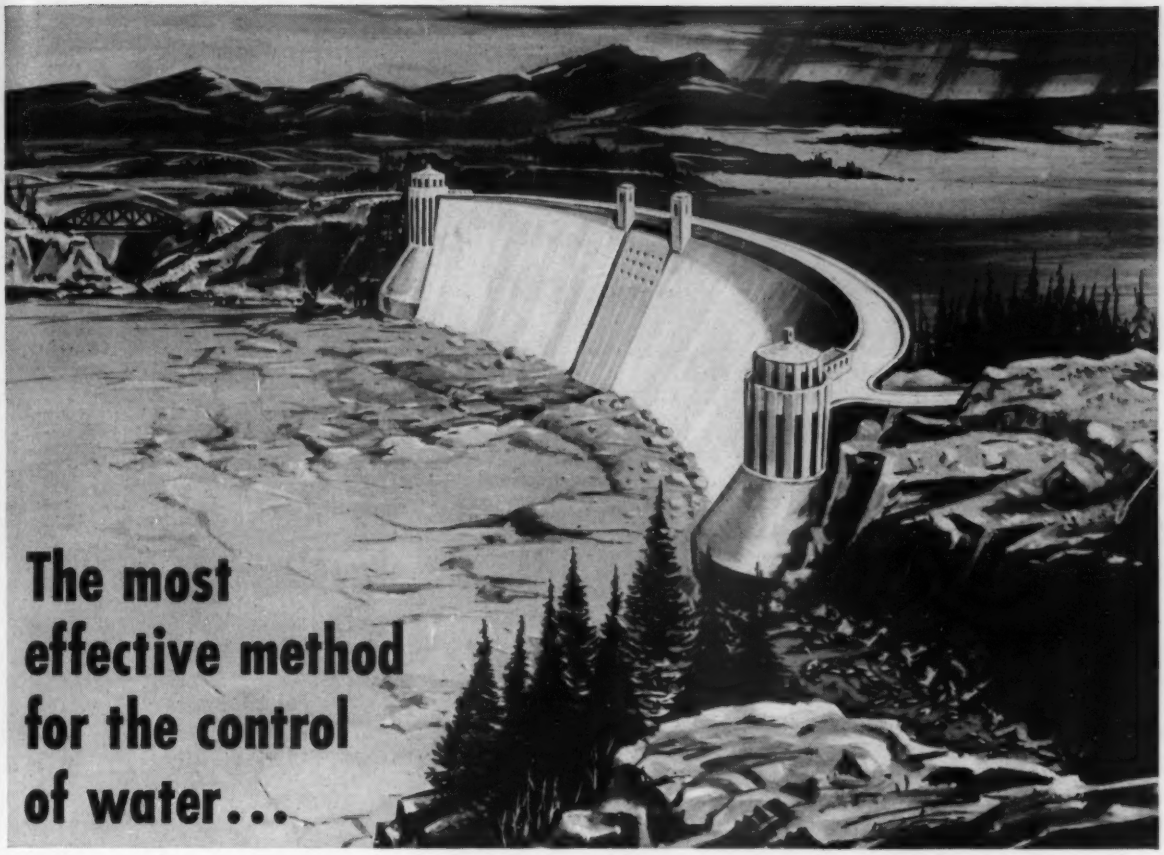

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Surtiseal is a clear, colorless liquid of low viscosity containing esters of boron and silicon in an aqueous base. It is stable, odorless and non-inflammable, unlike many ordinary water-proofing compounds. What's more, it absorbs readily into masonry surfaces for excellent coverage and lasting protection. One application covers an area of from 100 to 200 square feet and, properly applied, will last from 5 to 10 years, depending on the kind of surface treated.

Surtiseal can be applied easily by brush, roller or spray; goes on wet cement, concrete and damp basement walls with the same effectiveness as on dry masonry. May be used alone or forms an excellent base for masonry paint. And the surface brightener in Surtiseal will enhance masonry appearance. It actually improves visibility in road and turnpike applications.

You can rely on Surtiseal to protect sidewalks and roads from pitting due to salt and calcium chloride applied during winter icing, to prevent concrete cracking due to freezing and thawing, and to resist stains and discoloration on concrete, cement and stucco surfaces. Ideal for damp cellars, swimming pools, cinder block walls, tile cement, asbestos insulation and many other applications, especially where subject to hydrostatic heads, or condensation.

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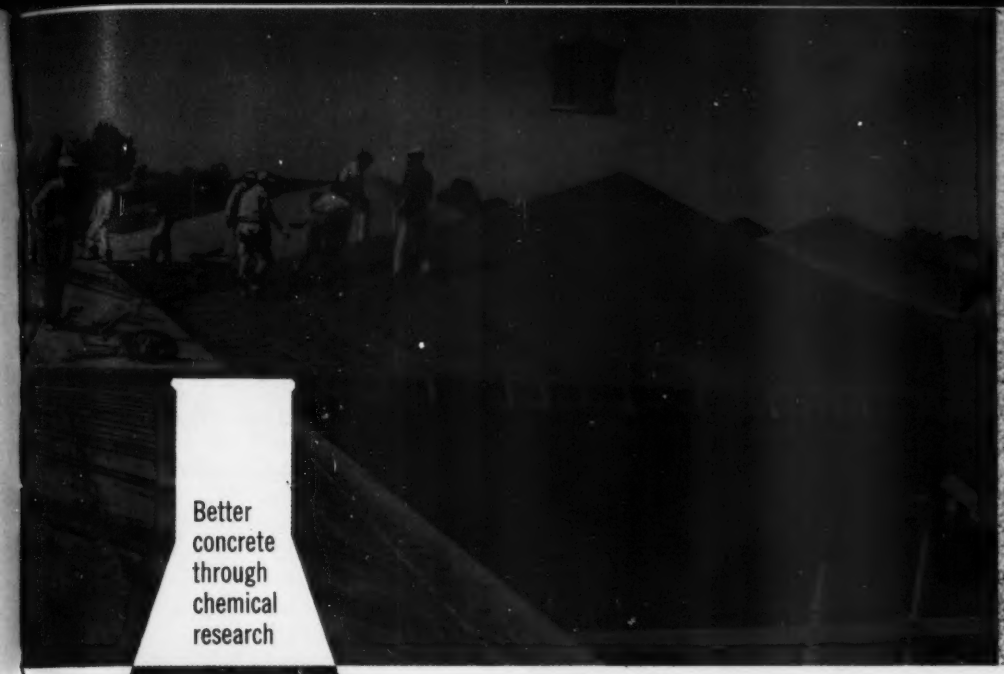
(continued from page 288)

is not less than 3,500 psi at 28 days. Placing for the walls proceeded in small lifts again with alternate bay construction and a 3-day delay. This technique does much to reduce both shrinkage and thermal stresses to the minimum. Formwork consisted of 5- by 8½-foot panels of 1½-inch board on steel-angle supports. The 11½-foot thick roof slab was placed in 5 lifts, the formwork being suspended from steel girders which spanned between the secondary walls. During placing of all the walls, temporary floors, suspended within the reactor, provided access and working platforms at different levels.

All concrete placing for reactor structures must be subject to rigorous control. Whatever the thickness of the shield or the type of aggregate used, the concrete must be completely homogeneous. The safety provided to the power station staff will be only as good as the weakest section of the concrete. Honeycombing or segregation during placing means that the intensity of the radiation passing through the faulty section will exceed the limit imposed by the design. Obviously shrinkage cracks must also be avoided, and construction joints must be made with care if there is to be a completely homogenous bond between two lifts.

The problem of insuring correct placing and compaction is greatly complicated by the large number of openings needed in the walls for operational and testing purposes. These ducts and instrument channels are of many sizes and shapes and are widely scattered. On small projects an attempt is often made during design to keep all openings within two wall sections only, thus simplifying placing. At large stations this is rarely possible. Hand placing and com-

(continued on page 292)



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Two short cuts in the roof construction pictured here helped substantially in meeting this tight-short construction schedule. The fifty hyperbolic roof paraboloids of reinforced concrete, each 47½' square and 2½" thick and supported by 24' diameter columns were constructed in rows, using only five sets of forms that were re-used. As each successive row was finished, plasterers, masons and other trades stepped in and went to work.

Dewey and Almy's WRDA, water reducing admixture, and DARATARD, initial set retarder, provided the second short cut. Architects had estimated that a 7-sack plain mix would be needed to develop 2,500 p.s.i. in 48 hours. Dewey and Almy liquid admixtures enabled Vonder Haar Concrete Co. to design a mix developing 3,500 p.s.i. in 40 hours.

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(continued from page 290)

paction are standard practice around all openings. Poker vibrators are used at all other points and a wetting agent is usually added to avoid excess water which may cause shrinkage. The introduction of large numbers of delicate thermocouples into the shield presents a further difficulty. These sensitive and easily-damaged instruments must be located accurately and must remain undisturbed during placing if they are to measure accurately the rate of heat rise within the shield as a result of neutron absorption.

Accuracy is a must in nuclear concreting. At the first British station, at Calder Hall, limits of within plus or minus 1/10 of an inch were specified for both vertical and horizontal dimensions. Such a small degree of tolerance had never before been attempted in a reinforced concrete structure. The problem was solved by fabricating a complete steel template gauge. Subsequent experience has shown that such very close limits are not significant, and at Hinkley Point they have been reduced to within plus ¼ inch and minus ⅛ inch for the inner surfaces of the reactor. Thicknesses are simply specified to be not less than the nominal size. Internal accuracy is important because it has a major effect on the efficiency of the reactor operation. For this reason the location of all metal inserts for equipment support must be within ¼ inch.

site casting of components

A reactor needs a thermal lining, or a surface to take the first shock of the high temperatures generated, and behind which the primary cooling medium can circulate. Solid steel panels, welded together, have proved excessively expensive, so

(continued on page 294)

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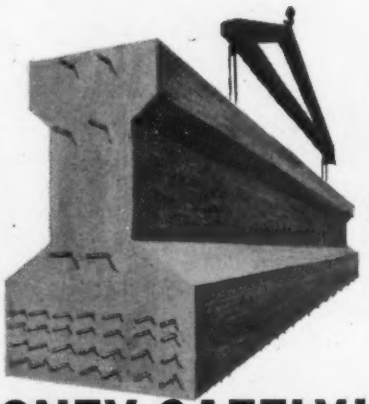

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(continued from page 292)

at Hinkley Point this thermal shield is built up of concrete panels precast at the site. Each panel has a rectangular frame of 9-inch steel channel which acted as a permanent form. The 14 casting beds (9 under cover and 5 in the open) were simply a flat steel plate laid over a concrete slab. The plates were oiled and the frame, with a layer of mesh reinforcement welded within it, was laid on the bed and filled with concrete. Finishing was by hand-troweling.

The panels were steam-cured under temporary covers and after 24 hours, when the crushing strength was not less than 2,500 psi, they were removed and placed on edge in the open to mature. The panels are of various sizes and the majority of them weigh about 3 tons each. Handling was by eye-bolts screwed into the frame.

At many stations site cast slabs, usually 4 feet square and 4 inches thick, are also used as permanent formwork for the walls of reactor, turbine, service, and administration buildings. Over 3,000 such slabs were used at the Bradwell Station, Essex. Casting was again on steel plates, laid directly on grade, and separated by timber battens to which the wooden sides of the molds were nailed. Reinforcement was laid in the mold and normal 1 : 2 : 4 concrete was placed to within ½ inch of the top. An exposed aggregate topping was then provided by scattering 1½-inch nominal size rounded flint gravel on the surface of the wet concrete. Open spaces were filled by hand-placing of more stones. The whole surface was then firmly tamped and leveled. After the initial set the facing was carefully hosed off with water and brushed with a soft broom to expose the surface of the aggregate cleanly without loosening

(continued on page 296)

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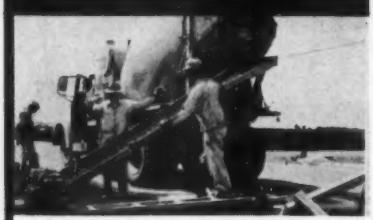

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(continued from page 294)

the bond of the stones. After 48 hours the sides of the mold were removed and the slabs were stacked on end to mature.

Reinforcement for these formwork slabs, which weigh about 800 pounds each, consisted of a single sheet of 6-inch square welded mesh of high tensile wire weighing about 6 pounds per square yard. Joints are formed by an overlapping step, half the thickness of the slab. The reinforcement extends into the step and two mild-steel links were included for lifting and mounting purposes.

The opportunities for using precast components in nuclear concreting are otherwise limited, since the fear of radiation loss rules out structural applications almost completely. Placing the concrete for the roof slab is always a major problem; the weight of a 10- to 12-foot thickness of reinforced concrete and the high degree of accuracy needed involve forms and falsework which must be, to say the least, substantial. The height of the slab from grade (100 to 120 feet) increases the problem. At Hinkley Point the problem was solved, as already mentioned, by suspending the forms from steel girders (actually war-time Bailey bridging). These girders span across the secondary shielding walls. The forms are then stripped and removed through openings within the reactor.

auxiliary structures

Many subsidiary structures of reinforced concrete are needed at a nuclear power station. The turbine hall, where the electricity is generated, requires a sizable quantity of concrete. At Hinkley Point about 35,000 cubic yards of concrete was placed for the hall and related culvert system. The basement of the hall is around

(continued on page 298)

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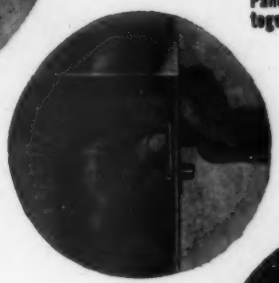

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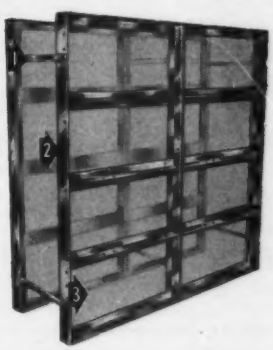

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750 feet long, 130 feet wide, and 30 feet deep. The height of the building is 94 feet. Complex foundations for the machinery introduced many problems in form design.

Water is needed at any power station; for nuclear energy the demand is particularly great—35 million gallons an hour at Hinkley Point. For this reason most British stations are located near the coast where sea water is available. At Hinkley Point the intake comprises a vertical shaft about 2,000 feet offshore, with two 12-foot diameter tunnels to convey the water from the shaft to the pump-house on shore. The outfall was built as two 2,000-foot long rectangular reinforced concrete culverts. At many stations these culverts are constructed using precast pipe as permanent formwork.

The intake shaft at Hinkley Point is an interesting structure. It has the form of a reinforced concrete cylinder 60 feet high and 90 feet in diameter, weighing 3,900 tons. Internal bracing is also of reinforced concrete. The cylinder, with two surrounding rings of sheet-steel piles, was constructed in a dry dock and floated into position. For this purpose a false floor of timber held in place by steel lattice girders was fitted. The operations of floating the cylinder out of the dock, towing, positioning and grounding required particularly deep water and had to be carried out in 4 hours on the day of the year when the highest tide (35 feet—the second highest in the world) was known to occur. Dredging of a channel was necessary near shore and the total distance towed was two-thirds of a mile.

Grounding was accomplished by lowering 8 steel legs down to sea-bed. When support was established satisfactorily the cylinder was flooded to give it stability at all states of the tide. The next stage was to drive home the sheet piling to form a cofferdam around the cylinder. Inside this cofferdam a shaft was excavated to connect with the intake tunnels being driven from offshore. Concrete for this shaft was conveyed over the water by a ropeway, supported on 4 intermediate towers.

Concrete is destined to play a major role in the construction of the nuclear power stations which are certain to be built in the next few years. Contractors, engineers and architects will all have an important share in these projects. This article has attempted to give some helpful information on construction details. A subsequent article will deal with the properties, value and use of heavy concrete for radiation shielding. END

JACKSON
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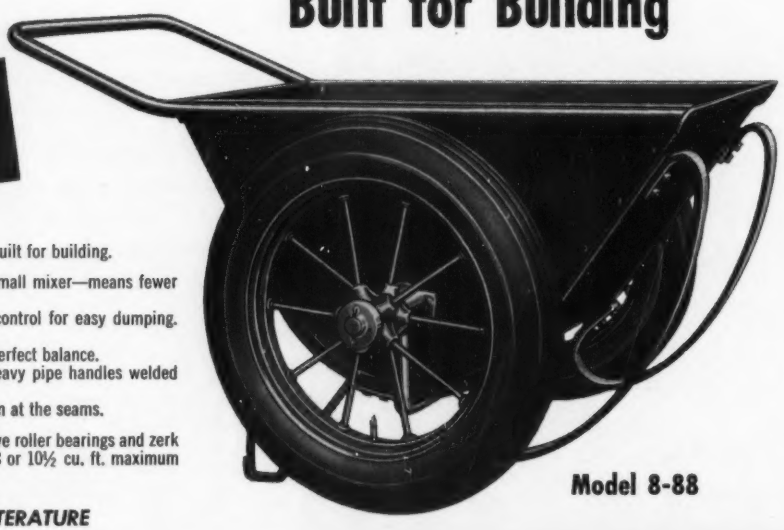
Built for Building



Contractors' favorites because they are built for building.

- Large capacity—a full batch from a small mixer—means fewer trips.
- Original rocker arm feature assures control for easy dumping. Will not roll back on operator.
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- Rugged construction features extra heavy pipe handles welded to body which reinforces edges.
- Flanged and riveted body will not open at the seams.

Pneumatic tired or all-steel wheels have roller bearings and zerk fittings. Available in models with 6, 8 or 10½ cu. ft. maximum capacity.

Model 8-88

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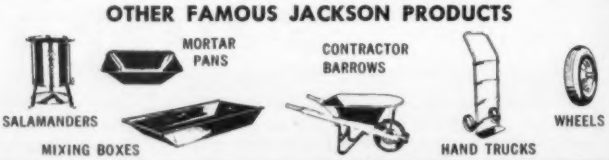

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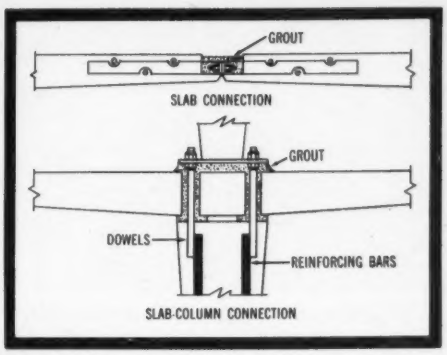
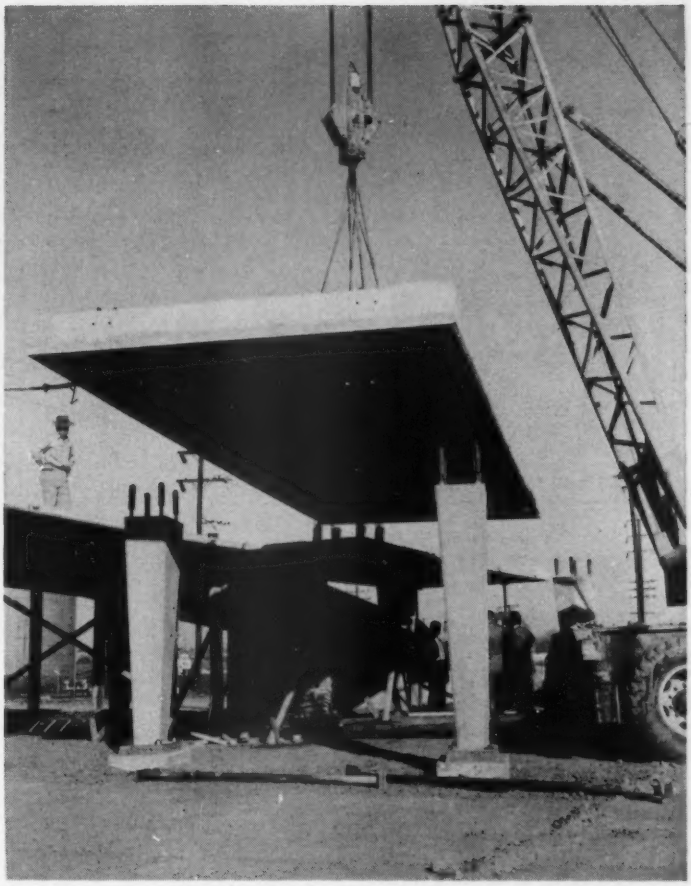




PHOTOS THROUGH COURTESY OF TISHMAN RESEARCH CORPORATION, NEW YORK, N. Y., DESIGNERS AND DEVELOPERS OF TIERPARK GARAGES

5000 psi in sixteen hours with SIKA SET

Grout and dry pack mortar with rapid strength development and minimal shrinkage is essential for the fast erection of the new Tierpark Parking Structures developed by Tishman Research Corporation. Composed of only three elements — slabs, columns and ramps — a Tierpark structure is erected within a matter of days.

Mix proportions for high strength grout and dry pack mortar were developed at the Sika Concrete Laboratory. Sika Set liquid, diluted 1:3, added to the dry pack produced compressive strengths exceeding 5000 psi at sixteen hours. Sika Set, diluted 1:4, added to the poured grout produced compressive strengths exceeding 3000 psi at sixteen hours. Proportions of 1 part Type III cement to 1-1/2 parts sand were used.

Structural concrete was initially retarded by the use of Plastiment Retarding Densifier to facilitate finishing — with rapid strength gain as an added bonus to the manufacturer of the precast, prestressed elements.

For full details on Sika Set Shrinkage Reducing Accelerator and Plastiment Retarding Densifier ask for your copies of SET-661 and PCD-59. Offices and dealers in principal cities, sixteen affiliate manufacturing companies around the world. In Canada, Sika Chemical of Canada, Ltd.; in Latin America, Sika Panama, S. A.

Sika

SIKA CHEMICAL CORPORATION

Passaic, N. J.

Free advice can be very expensive.

—Bob Sproule

"TODAY'S SNOWFALL is the earliest in thirty years," said the radio announcer last Tuesday. And today I received a bill for $25. These two seemingly unrelated facts brought me to the wisdom about advice.

It all began two weeks ago when Bill Neal started repairing the old bridge on Big Creek. Problems constantly held up work. And each time I visited the job, the temperature seemed to drop several degrees.

"Hey, Bill," I said one day, "I hope you have a supply of snow goggles handy, because you'll need them at the rate you're going."

"Very funny, Bob," he answered. "Why don't you use some of your energy blowing on the concrete to make it set faster."

"I've got something better than hot air, Bill. Calcium chloride will reduce set time by more than half and the temperature can be 20°F., or below. And your protection period is cut in half so you save money on labor, heaters, fuel, and canvas. I'll make a deal. You use calcium chloride and if you're not through before it snows, I'll buy the goggles," I laughed.

Now it's no laughing matter. But I'll try one more bit of advice. Save on your cold weather costs by reading our booklet, "Better Concrete in Every Season with Wyandotte Calcium Chloride." *Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan. Offices in principal cities.*

WYANDOTTE CHEMICALS

MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE

products

one-component repair material

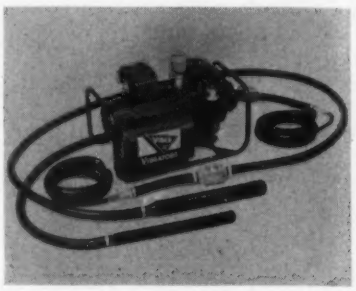
A one-component dry-mix cement compound for concrete finishing and patching requires only mixing with water before troweling on. It is said to be ideally suited for thin toppings to concrete slabs, for repairing concrete floors, steps, ramps, sidewalks, driveways and swimming pools. According to the manufacturer it does not oxidize, craze, get brittle or disintegrate and is nontoxic, non-fuming, non-caustic, vermin-proof, non-flammable and contains no volatile organic solvents. Larsen Products Corp., Box 5938-S, Bethesda 14, Md.

exposed aggregate retarder

A retarder for making exposed aggregate concrete can be applied to the surface of freshly placed concrete or to the formwork before placing. Retarder does not hinder the hardening of the concrete mass while chemically retarding the set of ⅛ inch of mortar at the surface. After 12 to 24 hours the retarded surface is washed away with a jet of water. Ceresit Corp., 3227 Shields Ave., Chicago 16, Ill.

thermostat-controlled heater

Space heater has two entirely separate sources of air, one to support combustion and the other for heated air circulation. Thermostat turns unit off at a predetermined temperature and serves as a safety switch that prevents overheating. Heater operates on regular 110-115 volt, 60 cycle AC, and uses kerosene or number 1 fuel oil. Available in three sizes. Champion Manufacturing Co., 3700 Forest Park, St. Louis, Mo.



motor-in-head vibrator

Designed for one-man operation, this vibrator can be easily handled on narrow scaffolding or high forms. Power is provided by a portable gasoline engine-generator plant which produces either AC or DC current and can be used to operate lights, other tools etc. The 180-cycle, 230-volt motor is built into the vibrator head and produces 10,500 rpm, with a waterproof, immersible on-off switch located near the vibrator head for easy accessibility. Viber Co., 726 S. Flower St., Burbank, Calif.

new integral color admixture

Wesco Materials Corp., 107 Brookhollow Service Center, Dallas, Texas, has started manufacture and distribution of "Colorfull," an admixture for integrally coloring ready mix through a range of ten colors. The manufacturer claims that it resists fading and has the quality of uniform color fidelity. Users report that ready mix trucks are cleaned out with no unusual effort, thus eliminating any possibility of color carryover to subsequent loads. Available to all concrete producers within Wesco's marketing area as well as to contractors and architects.

Franklin P. Taylor (right), Vice President, Sales, Buffalo Crushed Stone Company, a Unit of Houdaille, Bowmansville, N. Y., with Wayne Ross, his Dodge representative.

"At least 95% of our annual volume comes from following leads in Dodge Reports."

"Keeping every one of our salesmen posted on the selling opportunities in new construction in our area would be virtually impossible without the detailed, up-to-the-minute data we receive every morning in Dodge Reports," says Mr. Taylor. "In our competitive market, a lag of just a few hours could mean a loss of substantial amounts of business. That's why we depend so heavily on the timeliness of Dodge Reports."

Buffalo Crushed Stone is one of the leading material suppliers in the greater Buffalo area and western New York State. It sells ready mix concrete, sand, gravel, concrete pipe, precast and pre-stressed concrete members, crushed stone and bituminous concrete through three sales divisions.

Each morning, the day's Dodge Reports are routed directly to Mr. Taylor for action. "I check them immediately," he says, "for jobs that involve our products and assign these jobs to the various sales divisions. Each project is entered (in detail) on a product sheet for use in our weekly sales reports. This way, even the first sales call on a prospect is an *effective* one – with the salesman able to discuss the prospect's needs intelligently. Each follow-up is also entered on this sheet and initialled by the salesman assigned.

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redesigned power trowels

The manufacturer announces 11 completely redesigned power trowels. Improvements include a lower center of gravity for easier handling, stabilizer ring for smoother operation, air-cooled gear box for longer life, positive-action "kill" switch for greater safety and a longer handle with 25% less pull on the operator. Each model, from 30 inches to 46 inches is properly powered for peak efficiency. Whiteman Manufacturing Co., 13020 Pierce St., Pacoima, Calif.

portable space heater

A low-cost, oil-fired, portable heater consists basically of a combustion chamber, a fan which blows air through the combustion chamber at a rate of 800 cu. ft. per minute that throws the heat out 25 feet, a built in 5-gallon fuel tank, a modulating control to adjust the heat output, and a starting switch that starts the heater up instantly. There is no exposed flame and the heater operates without smoke or odor. Stow Mfg. Co., 354 Shear St., Binghamton, N. Y.

snow-melting electric cable

A new electric metal-sheathed defrosting element will save snow-shoveling throughout the winter season. The heating cable can be imbedded in concrete. These surfaces can be kept free of snow build-up by pressing a switch putting the cable in operation. Average operating cost is 15 cents an hour for clearing wheel tracks of a 50-foot driveway. Edwin L. Wiegand Co., 7779 Thomas Blvd., Pittsburgh 8, Pa.

building project reports

A 24-page booklet, "Dodge Reports: How to Use Them Effectively," explains fully the purpose and use of these construction reports. Dodge Reports tell you what new construction is contemplated, being planned, ready for bidding and what contracts have been awarded, as well as who will award the contract, specify materials and equipment, and do the buying. Suggestions on effective selling are included. F. W. Dodge Corp., Construction Div., 119 West 40th St., New York, N.Y.

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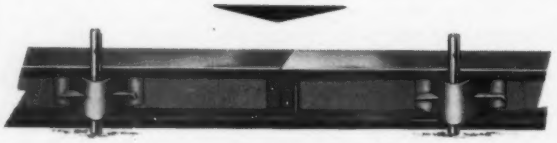

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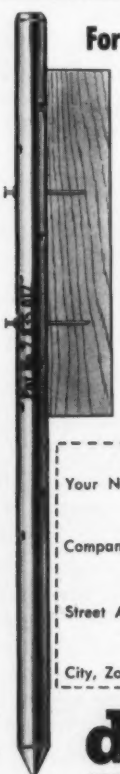

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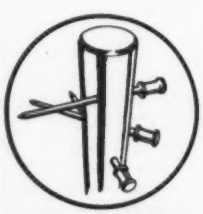
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STEEL SHEETPILING and 65′ H-beam soldier beams, spaced 7′ c-c, were driven before excavation. Timber lagging increased from 3″ thick for the top 20′, to 4″ for the next 10′ and 6″ thick to the bottom of the 64′ deep pit. Contractor: W. L. Hailey & Co., Nashville, Tenn. Designers and consultants: Metcalf & Eddy, Boston, Mass.

CIRCULAR RIBS, 101′ in diameter, were cast-in-place as the excavation reached their levels. Each was reinforced with four No. 6 bars in both the inside and outside faces, and No. 4 bar stirrups at 6′ c-c. 5′ thick base slab for pumping station and forms for lower walls show at bottom.

Cast-in-place concrete wales brace cofferdam

Six 3′ wide x 2′ thick circular reinforced concrete wales, cast-in-place, proved a successful new way to support the 101′ diameter, 64′ deep cofferdam for a sewage pumping station in Louisville.

Sheetpiling and soldier beams were driven before excavation. During excavation, timber lagging was inserted against the face of the cut. At 17′ below ground level, the first ring was cast. When the concrete, designed for 3,000 psi at 7 days, had reached 2,500 psi in the first ring, excavation proceeded to 27′ depth for the second wale. Remaining wales are at 36′, 39′, 50′ and 55′.

Each wale required 75 cu. yd. of ready mixed concrete. Four 2 cu. yd. buckets, handled by two cranes, placed the material. While one bucket was pouring, the other was being charged from the truck mixers. Felt layers between wales and soldier beams prevented bond.

During backfilling, the concrete wales on each side of the sheetpiling were severed so that soldier beams could be pulled without strain on the sheetpiling and pump station structure.

Concrete for cofferdam and pumping station totalled 4,140 cu. yd. On-schedule deliveries, including one 810 cu. yd. pour in 14 hours, were maintained by truck mixers of certified design, capacity, mixing speed and water control accuracy.

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catalog of builder's tools

A new 64-page catalog illustrates and describes machines and hand tools used by trowel tradesmen, trowel trades contractors, and general contractors. The book includes descriptions and pictures of a piston pump plastering machine, mechanical drywall texturing equipment and over 1,000 other new and traditional tools. Goldblatt Tool Co., 1910 Walnut, Kansas City, Mo.

rust-preventive form coating

Nox-Crete Form Coating is said by the manufacturer to cut maintenance costs on steel forms. This coating reacts chemically with concrete mix to prevent bonding and rust. Within hours after spraying, coating reacts chemically to form a rain-and-rust proof surface. It eliminates rust spots and spalling of concrete surfaces, makes forms self-cleaning and rust-free. Dealer franchises available. Nox-Crete Co., 20th and William Sts., Omaha, Neb.

horizontal shoring catalog

A 12-page catalog gives the complete story of Rex-Spanall steel shoring. The manufacturer claims this pre-engineered telescopic steel shoring can save time and costs on all poured slab and deck work. Catalog shows construction uses, and gives erection and stripping information. Rex-Spanall, Inc., 6427 W. Capitol Drive, Milwaukee 16, Wis.

tips on concreting

Careful job-site control of mixing water is essential for getting the best results in all types of concrete construction. Much has been said and written on the subject of controlling the amount of mixing water. Here it is expressed in terms everyone can understand — money. Free reprints are available of this and other helpful tips on concreting. Alpha Portland Cement Co., Alpha Building, Easton, Pa.

integral concrete color card

Swimming pool decks, driveways, patios, concrete walls, parking areas may be permanently colored by the addition of color material to the ready mix. Color in concrete will reduce the glare caused by sun and will lend beauty and harmony in color to areas surrounding buildings. Color card available. Frank D. Davis Co., 3285 E. 26th St., Los Angeles, Calif.

power trowel

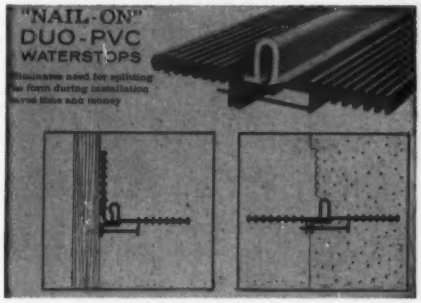
Center-blade suspension power trowels float and finish slabs without change of blades (extra wide clip-on float blades are available where required). The manufacturer claims the power trowels outperform skilled hand troweling four times faster. Available in 29-inch and 39-inch models with heavy duty uniframe construction throughout. Thor Power Tool Co., 175 N. State St., Aurora, Ill.

steel forms catalog

A 20-page catalog just released, describes and illustrates a wide variety of construction projects on which these steel forms are particularly suitable, including curved walls, tapered walls, tunnels, columns, corbels and offsets as well as simple walls. The catalog pictures various sizes and styles of form panels, accessories, supplies and tools, and explains money-saving features. Economy Forms Corp., Box 128-AF, Highland Park Sta., Des Moines, Iowa.

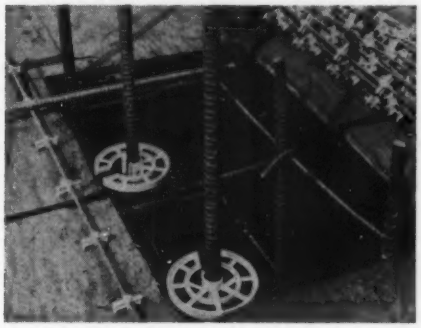
residential forms system

The manufacturer claims savings of time and work with a complete system with patented locking hardware bolted to panels and no danger of losing vital parts. Inner and outer forms go up simultaneously with accuracy maintained through positive lever action that "pulls" forms tightly together. For use above or below grade—on residential projects or light commercial construction. Simplex Forms, 5603 Industrial Ave., Rockford, Ill.



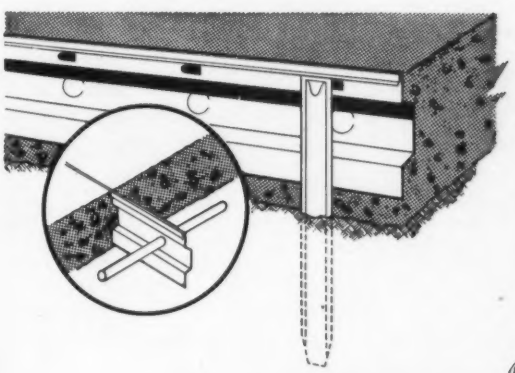
nail-on waterstop

Specifically designed to eliminate the need for splitting the form during installation, this waterstop is extruded with a special nailing tab, prepunched on six-inch centers, that is merely nailed to the concrete form with special double-headed nails. The nails not only anchor the waterstop to the form but also help to hold the waterstop in correct position during the placing of the concrete. W. R. Meadows, Inc., 26 Kimball St., Elgin, Ill.



plastic accessories for holding reinforcement

New plastic accessories for reinforced concrete take the place of steel slab bolsters or concrete blocks. Made of high-density polyethylene, these accessories are available in a variety of types to fit various heights and rod sizes, include continuous slab and beam bolsters, mesh bolsters that snap into place, and plastic donuts for holding exact clearance between reinforcing bars and form face. Designed and supplied by Universal Builders Supply Co., Inc., 41 E. 42nd St., New York 17, N. Y.



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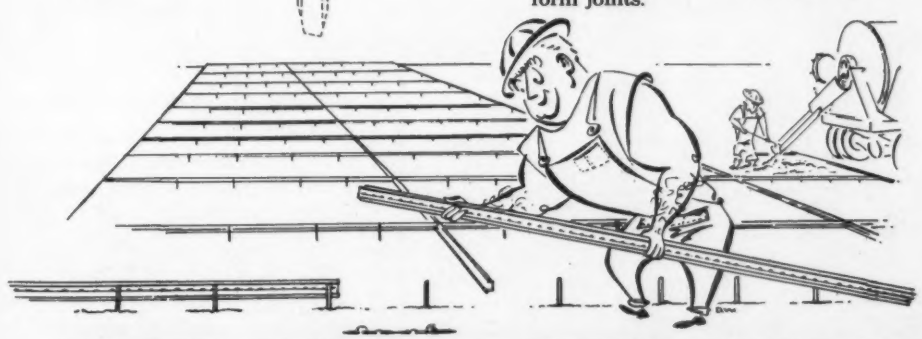

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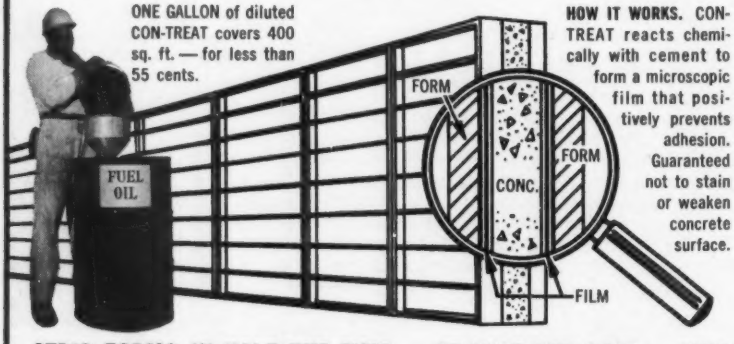
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1. **YOU SAVE MONEY.** CON-TREAT costs half as much as other "quality" release agents; goes *three times* as far as "cheaper" substitutes. Mixed with low-cost fuel oil or kerosene, costs less than 55¢ per gal. *delivered!*
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EDICK LABORATORIES, INC. 2358 S. Burrell St. Milwaukee 7, Wisconsin

catalog on concrete vibrators

An illustrated catalog shows the complete line of Remington vibrators and lists specifications and performance data. The manufacturer claims to have the most complete line of vibrators on the market—gasoline, air and electric powered—and that most parts are interchangeable from model to model. Remington Arms Co., 25000 S. Western, Park Forest, Ill.

shoring frames bulletin

Heavy duty "Trouble Saver" shoring frames are designed for heavy duty work in accordance with high standards of safety, are tested under simulated field conditions and are proved on recent jobs to safely support up to 10,000 lbs. on each leg. U-head, sprockets, adjustable legs, base plates can be arranged in any manner, top or bottom. The Patent Scaffolding Co., Inc., 38-21 12th St., Long Island City 1, N.Y.

curing compounds catalog

Complete specifications on 100% resin base type, white pigmented type and wax-resin base curing types of concrete curing compounds are available in this catalog. The functions and advantages of each are fully covered, together with method of application, coverage, quantities required and packaging. A. C. Horn Co.'s, Div. Sun Chemical Corp., 2133 85th St., North Bergen, N. J.

catalog of forming ideas

Modern forming methods can save you time, trouble and money. This 30-page catalog tells and shows how you can profit from "assembly-line" forming. It covers all kinds—curb, gutter and sidewalk — with features, check list of types, pictures and descriptions, information on setups. Also includes flexible forms, road and airport forms. Bulletin 60 - 163. Chain Belt Co., 4671 West Greenfield, Milwaukee 1, Wisconsin.

products

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waterproofing agent for fallout shelters

This new waterproofing agent for concrete is said to provide protection against seepage of water carrying dangerous radioactive materials resulting from nuclear fall-out. One problem connected with shelters is the difficulty of preventing the penetration of water from the surrounding earth. This water, carrying dissolved radioactive salts, can produce a dangerous level of radioactivity within the shelter. The manufacturer claims that this waterproofing agent, Surtiseal, combines with the concrete to form a finish that completely repels water. Guardian Chemical Corp., 38-15 30th St., Long Island City 1, N. Y.

concrete hardener catalog

The manufacturer claims that Fluat-treated concrete floors have substantially increased resistance to wear, acids, alkalis and oils. Fluat is a clear liquid that penetrates into the pores of new or old concrete, where it reacts with the free lime and calcium carbonate to turn these relatively soft compounds into hard, insoluble silicates which completely fill and seal the concrete pores. It is easily applied to any clean, dry concrete surface with an ordinary brush. Catalog available. Tretol, Inc., 6051 W. 65th St., Chicago, Ill.

adjustable screed support

General and concrete contractors will find that this adjustable screed support provides a fast easy way to set up and minutely adjust their screed supports. The unique design of the brackets with the fast acting set screw permit them to be used with wooden, flat steel or pipe screeds by merely changing the angle of the bracket to suit the screed bar. Screed posts are available with screw type points for wooden decks, with screed pads for use over waterproofing or insulation materials, or with standard steel stakes for slabs poured directly on the ground. Dee Concrete Accessories Co., 670 N. Michigan Ave., Chicago 11, Ill.

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